

## **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

1           1. (Currently amended) A method for logging file system operations,  
2     comprising:  
3           receiving a request to perform a file system operation;  
4           making a call to an underlying file system to perform the file system  
5     operation; and  
6           logging the file system operation to a log within a log device to facilitate  
7     recovery of the file system operation in the event of a system failure before the file  
8     system operation is committed to non-volatile storage;  
9           wherein the request to perform the file system operation is received at a  
10          primary server in a highly available system; and  
11          wherein the log device is located on a secondary server that is separate  
12          from the primary server in the highly available system and that acts as a backup  
13          for the primary server.

1           2. (Original) The method of claim 1, wherein logging the file system  
2     operation involves storing an identifier for the file system operation to the log  
3     device.

1           3. (Original) The method of claim 1, further comprising periodically  
2     committing the log to the underlying file system by:  
3           freezing ongoing activity on a file system;

4 making a call to the underlying file system to flush memory buffers to non-  
5 volatile storage, whereby outstanding file system operations are guaranteed to be  
6 committed to non-volatile storage;  
7 removing outstanding file system operations from the log; and  
8 unfreezing the ongoing activity on the file system.

1 4. (Original) The method of claim 1, wherein upon a subsequent computer  
2 system startup, the method further comprises:  
3 examining the log within the log device;  
4 replaying any file system operations from the log that have not been  
5 committed to non-volatile storage.

1 5. (Original) The method of claim 1, further comprising checking for  
2 dependencies between the file system operation and ongoing file system  
3 operations; and  
4 if dependencies are detected, ensuring that the file system operation and  
5 the ongoing file system operations complete in an order that satisfies the  
6 dependencies.

1 6 (Canceled).

1 7. (Original) The method of claim 1, further comprising:  
2 associating the file system operation with a transaction identifier for a set  
3 of related file system operations; and  
4 wherein logging the file system operation involves storing the file system  
5 operation with the transaction identifier to the log device.

1           8. (Original) The method of claim 1, wherein logging the file system  
2 operation involves:  
3           determining if the file system operation belongs to a subset of file system  
4 operations that are subject to logging; and  
5           if so, logging the file system operation.

1           9. (Original) The method of claim 8, wherein the subset of file system  
2 operations are non-idempotent file system operations.

1           10. (Original) The method of claim 1, wherein the log device stores the  
2 file system operation in volatile storage.

1           11. (Original) The method of claim 1, wherein the log device stores the  
2 file system operation in non-volatile storage.

1           12. (Currently amended) A computer-readable storage medium storing  
2 instructions that when executed by a computer cause the computer to perform a  
3 method for logging file system operations, the method comprising:  
4           receiving a request to perform a file system operation;  
5           making a call to an underlying file system to perform the file system  
6 operation; and  
7           logging the file system operation to a log within a log device to facilitate  
8 recovery of the file system operation in the event of a system failure before the file  
9 system operation is committed to non-volatile storage;  
10           wherein the request to perform the file system operation is received at a  
11           primary server in a highly available system; and

12        wherein the log device is located on a secondary server that is separate  
13        from the primary server in the highly available system and that acts as a backup  
14        for the primary server.

1            13. (Original) The computer-readable storage medium of claim 12,  
2        wherein logging the file system operation involves storing an identifier for the file  
3        system operation to the log device.

1            14. (Original) The computer-readable storage medium of claim 12,  
2        wherein the method further comprises periodically committing the log to the  
3        underlying file system by:  
4            freezing ongoing activity on a file system;  
5            making a call to the underlying file system to flush memory buffers to non-  
6        volatile storage, whereby outstanding file system operations are guaranteed to be  
7        committed to non-volatile storage;  
8            removing outstanding file system operations from the log; and  
9            unfreezing the ongoing activity on the file system.

1            15. (Original) The computer-readable storage medium of claim 12,  
2        wherein upon a subsequent computer system startup, the method further  
3        comprises:  
4            examining the log within the log device;  
5            replaying any file system operations from the log that have not been  
6        committed to non-volatile storage.

1            16. (Original) The computer-readable storage medium of claim 12,  
2        wherein the method further comprises checking for dependencies between the file  
3        system operation and ongoing file system operations; and

4 if dependencies are detected, ensuring that the file system operation and  
5 the ongoing file system operations complete in an order that satisfies the  
6 dependencies.

1 17 (Canceled).

1 18. (Original) The computer-readable storage medium of claim 12,  
2 wherein the method further comprises:  
3 associating the file system operation with a transaction identifier for a set  
4 of related file system operations; and  
5 wherein logging the file system operation involves storing the file system  
6 operation with the transaction identifier to the log device.

1 19. (Original) The computer-readable storage medium of claim 12,  
2 wherein logging the file system operation involves:  
3 determining if the file system operation belongs to a subset of file system  
4 operations that are subject to logging; and  
5 if so, logging the file system operation.

1 20. (Original) The computer-readable storage medium of claim 19,  
2 wherein the subset of file system operations are non-idempotent file system  
3 operations.

1 21. (Original) The computer-readable storage medium of claim 12,  
2 wherein the log device stores the file system operation in volatile storage.

1 22. (Original) The computer-readable storage medium of claim 12,  
2 wherein the log device stores the file system operation in non-volatile storage.

1           23. (Currently amended) An apparatus that logs file system operations,  
2 comprising:  
3           a receiving mechanism that is configured to receive a request to perform a  
4 file system operation;  
5           a calling mechanism that is configured to make a call to an underlying file  
6 system to perform the file system operation; and  
7           a logging mechanism that is configured to log the file system operation to  
8 a log within a log device to facilitate recovery of the file system operation in the  
9 event of a system failure before the file system operation is committed to non-  
10 volatile storage;  
11           wherein the receiving mechanism is located within a primary server in a  
12 highly available system; and  
13           wherein the log device is located within a secondary server that is separate  
14 from the primary server in the highly available system and acts as a backup for the  
15 primary server.

1           24. (Original) The apparatus of claim 23, wherein the logging mechanism  
2 is configured to store an identifier for the file system operation to the log device.

1           25. (Original) The apparatus of claim 23, wherein the logging mechanism  
2 is configured to periodically:  
3           freeze ongoing activity on a file system;  
4           make a call to the underlying file system to flush memory buffers to non-  
5 volatile storage, whereby outstanding file system operations are guaranteed to be  
6 committed to non-volatile storage;  
7           remove outstanding file system operations from the log; and to  
8           unfreeze the ongoing activity on the file system.

1           26. (Original) The apparatus of claim 23, further comprising a recovery  
2 mechanism that operates during system startup, wherein the recovery mechanism  
3 is configured to:  
4           examine the log within the log device; and to  
5           replay any file system operations from the log that have not been  
6 committed to non-volatile storage.

1           27. (Original) The apparatus of claim 23, further comprising a dependency  
2 handler that is configured to:  
3           check for dependencies between the file system operation and ongoing file  
4 system operations; and to  
5           ensure that the file system operation and the ongoing file system  
6 operations complete in an order that satisfies dependencies if dependencies are  
7 detected.

1           28 (Canceled).

1           29. (Original) The apparatus of claim 23, further comprising a transaction  
2 mechanism that is configured to associate the file system operation with a  
3 transaction identifier for a set of related file system operations; and  
4           wherein the logging mechanism is configured to log the file system  
5 operation with the transaction identifier to the log device.

1           30. (Original) The apparatus of claim 23, wherein the logging mechanism  
2 is configured to:  
3           determine if the file system operation belongs to a subset of file system  
4 operations that are subject to logging; and to

5           log the file system operation if the file system operation belongs to the  
6   subset of file system operations that are subject to logging.

1           31. (Original) The apparatus of claim 30, wherein the subset of file system  
2   operations are non-idempotent file system operations.

1           32. (Original) The apparatus of claim 23, wherein the log device is  
2   configured to store the file system operation in volatile storage.

1           33. (Original) The apparatus of claim 23, wherein the log device is  
2   configured to store the file system operation in non-volatile storage.